Listing of Claims

Claims 1-223: (canceled)

224. (previously presented): A method of causing plural input signals representing respective channels to appear to emanate from respective different positions in space, said method comprising:

providing a sound reflective or resonant surface at each of said positions in space;

providing an array of output transducers distal from said positions in space; and

directing, using said array of output transducers, sound waves of each channel towards the respective position in space to cause said sound waves to be re-transmitted by said reflective or resonant surface;

said step of directing comprising:

obtaining, in respect of each transducer, a delayed replica of each input signal delayed by a respective delay selected in accordance with the position in the array of the respective output transducer and said respective position in space such that the sound waves of the channel are directed towards the position in space in respect of that channel;

summing, in respect of each transducer, the respective delayed replicas of each input signal to produce an output signal; and

routing the output signals to the respective transducers.

225. (currently amended): A method according to claim 224, wherein said step of obtaining, in respect of each output transducer, a delayed replica of the input signal comprises:

replicating said input signal ~~said predetermined number times~~ to obtain a replica signal in respect of each output transducer;

delaying each replica of said input signal by said respective delay selected in accordance with the position in the array of the respective output transducer and said respective position in space.

226. (previously presented): A method according to claim 224 further comprising: calculating, before said delaying step, the respective delays in respect of each input signal replica by:

determining the distance between each output transducer and the position in space in respect of that input signal;

deriving respective delay values such that the sound waves from each transducer for a single channel arrive at said position in space simultaneously.

227. (previously presented): A method according to claim 224 further comprising:

inverting one of said plural input signals;

obtaining, in respect of each output transducer, a delayed replica of said inverted input signal delayed by a respective delay selected in accordance with the position in the array of the respective transducer, so that sound waves derived from said inverted input signal are directed at a position in space so as to cancel out at least partially sound waves derived from that input signal at that position in space.

228. (currently amended): A method according to claim 227, wherein said step of obtaining, in respect of each output transducer, a delayed replica of said inverted input signal comprises:

replicating said inverted input signal ~~said predetermined number times~~ to obtain a replica signal in respect of each output transducer;

delaying each replica of said inverted input signal by a respective predetermined delay selected in accordance with the position in the array of the respective output transducer.

229. (currently amended): A method according to claim 227, wherein said inverted input signal is scaled so that the sound waves derived from said inverted input signal ~~substantially~~ cancel sound waves derived from that input signal at said position in space.

230. (currently amended): A method according to claim 229, wherein said scaling is selected by determining, in respect of the input signal which has been inverted, the

magnitude of sound waves at said position in space and selecting said scaling so that sound waves derived from said inverted input signal have ~~substantially~~ the same magnitude at that position.

231. (previously presented): A method according to claim 224, wherein at least one of said surfaces is provided by a wall of a room or other permanent structure.

232. (previously presented): An apparatus for causing plural input signals representing respective channels to appear to emanate from respective different positions in space, said apparatus comprising:

a sound reflective or resonant surface at each of said positions in space;

an array of output transducers distal from said positions in space; and

a controller for directing, using said array of output transducers, sound waves of each channel towards that channel's respective position in space such that said sound waves are re~ transmitted by said reflective or resonant surface;

said controller comprising:

replication and delay means arranged to obtain, in respect of each transducer, a delayed replica of the input signal delayed by a respective delay selected in accordance with the position in the array of the respective output transducer and said respective position in space such that the sound waves of the channel are directed towards the position in space in respect of that input signal;

adder means arranged to sum, in respect of each transducer, the respective delayed replicas of each input signal to produce an output signal; and

means to route the output signals to the respective transducers such that the channel sound waves are directed towards the position in space in respect of that input signal.

233. (previously presented): An apparatus according to claim 232, wherein said controller further comprises:

calculation means for calculating the respective delays in respect of each input signal replica by:

determining the distance between each output transducer and the position in

space in respect of that input signal;

deriving respective delay values such that the sound waves from each transducer for a single channel arrive at said position in space simultaneously.

234. (previously presented): An apparatus according to claim 232, wherein said controller further comprises:

an inverter for inverting one of said plural input signals;

second replication and delay means arranged to obtain, in respect of each output transducer, a delayed replica of said inverted input signal delayed by a respective delay selected in accordance with the position in the array of the respective transducer and a second position in space so that sound waves derived from said inverted input signal are directed at said second position in space so as to cancel out at least partially sound waves derived from that input signal at said second position in space.

235. (currently amended): An apparatus according to claim 234, wherein said controller further comprises a scaler for scaling said inverted input signal so that the sound waves derived from said inverted input signal ~~substantially~~ cancel sound waves derived from that input signal at said second position in space

236. (currently amended): An apparatus according to claim 232, wherein said surfaces are reflective and have a roughness on the scale of ~~the~~ a wavelength of sound frequency it is desired to diffusely reflect.

237. (previously presented): An apparatus according to claim 232, wherein said surfaces are optically-transparent.

238. (previously presented): An apparatus according claim 233, wherein at least one of said surfaces is a wall of a room or other permanent structure.

239. (previously presented): An apparatus for causing plural input signals representing respective channels to appear to emanate from respective different

positions in space, for use with reflective or resonant surfaces at each of said positions in space, said apparatus comprising:

an array of output transducers distal from said positions in space; and

a controller for directing, using said array of output transducers, sound waves of each channel towards that channel's respective position in space such that said sound waves are retransmitted by said reflective or resonant surface;

said controller comprising:

replication and delay means arranged to obtain, in respect of each transducer, a delayed replica of the input signal delayed by a respective delay selected in accordance with the position in the array of the respective output transducer and said respective position in space such that the sound waves of the channel are directed towards the position in space in respect of that input signal;

adder means arranged to sum, in respect of each transducer, the respective delayed replicas of each input signal to produce an output signal; and

means to route the output signals to the respective transducers such that !the channel sound waves are directed towards the position in space in respect of that input signal.

240. (previously presented): An apparatus according to claim 239, wherein said controller further comprises:

calculation means for calculating the respective delays in respect of each input signal replica by:

determining the distance between each output transducer and the position in space in respect of that input signal;

deriving respective delay values such that the sound waves from each transducer for a single channel arrive at said position in space simultaneously.

241. (previously presented): An apparatus according to claim 239, wherein said controller further comprises:

an inverter for inverting one of said plural input signals;

second replication and delay means arranged to obtain, in respect of each output transducer, a delayed replica of said inverted input signal delayed by a

respective delay selected in accordance with the position in the array of the respective transducer and a second position in space so that sound waves derived from said inverted input signal are directed at said second position in space so as to cancel out at least partially sound waves derived from that input signal at said second position in space.

242. (previously presented): An apparatus according to claim 241, wherein said controller further comprises:

an inverter for inverting one of said plural input signals;

second replication and delay means arranged to obtain, in respect of each output transducer, a delayed replica of said inverted input signal delayed by a respective delay selected in accordance with the position in the array of the respective transducer and a second position in space so that sound waves derived from said inverted input signal are directed at said second position in space so as to cancel out at least partially sound waves derived from that input signal at said second position in space.